



MORE THAN HOT WEATHER

Nitrates Can Be Your Livestock's Worst Enemy

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Hot dry weather can bring more than just higher utility bills. In forage production, such weather can result in the accumulation of nitrates and/or prussic acid in certain grasses. Grasses containing these compounds are toxic to livestock. This can also be extended to corn and sorghum harvested for forage. Proper management can prevent the costly loss of livestock.

NITRATES

The nitrate form of nitrogen is the primary form taken up by plants. Normally, these nitrates are reduced to ammonium ions and then assimilated into proteins for plant use via the nitrate reductase metabolic pathway. Nitrate reduction occurs in the roots for some grasses such as bermuda. In other grasses such as corn or sorghum, the reduction occurs in the leaves and stalks. Under drought or stress conditions, this pathway may shut down and allow the accumulation of nitrates in the plant.

Nitrates accumulate when:

- 1. Adequate moisture with very high temperatures. The reductase pathway may shut down. As the plant transpires, nitrates will begin to accumulate and concentrate.**
- 2. Minimum moisture for limited water uptake combined with presence of available fertilizer N. The reductase pathway shuts down. Enough moisture maybe present to allow the plant to take up water containing nitrates from fertilizer applications, thus causing the accumulation of nitrates.**
- 3. Plants low in nitrates receives minimal amount of rain under very high temperatures. The moisture is sufficient to allow the uptake of nitrates from the soil, but the plant is so stressed that the reductase pathway remains shut down. Due to high temperatures and limited moisture, the plant never resumes active growth and nitrates accumulate.**

Nitrates will remain in plants after cutting and baling. Three to five days of active growth are needed to significantly reduce the nitrate levels. Based upon findings of the Texas Veterinary Diagnostic Medical Laboratory, a level of 1% nitrate is the cut off point for healthy ruminants. Forages higher than 1% could be fed if nitrate-tainted forage is "ground" with nitrate free forage to reduce overall nitrate levels <1%.

For forages grown under the conditions described above, proper management practices would include testing for nitrates. Ten to fifteen plants from representative areas with the same fertility and moisture conditions should be collected for analysis. If the forage has already been baled, take representative core samples from the bales for analysis.

Nitrate accumulation is known to occur in the following plants:

Forages	Weeds
Alfalfa	Canada thistle
Barley	Dock
Corn	Jimsonweed
Flax	Johnson Grass
Millet	Kochia
Oats	Lambsquarter
Rape	Nightshade
Rye	Pigweed
Soybean	Russian thistle
Sorghum	Smartweed
Sudangrass	Wild sunflower
Sugarbeets	

Nitrate results may be expressed as actual nitrate(%NO₃) or nitrate-N (%NO₃-N) values. The Extension Soil, Water and Forage Testing Laboratory reports the results as actual nitrate. To convert nitrate-N levels to actual nitrate, divide by 4.42. Results may also be reported in parts per million (ppm). To convert ppm to %, divide by 10,000.

PRUSSIC ACID

Sudangrass, sorghum and Johnson grass belong to a group of plants that produce cyanide. These plants produce cyanogenetic glucosides during their growing stages. Glucosides are sugar compounds that break down into glucose sugars through the process of hydrolysis. In cyanogenetic plants, hydrolysis frees the cyanide from the sugar, and it forms hydrocyanic acid. Hydrocyanic acid (HCN) is commonly known as prussic acid. Under normal growing conditions, the glucosides remain intact in the plants and are readily eliminated by animals when fed. However, under drought conditions, plant growth and development may be retarded which results in larger production of prussic acid.

Testing for prussic can be done at the Texas Veterinary Diagnostic Medical Laboratory.

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FORAGE ANALYSIS

The Texas Agricultural Extension Service Soil, Water, and Forage Testing Laboratory provide routine analysis of plant nitrates, protein, ADF, and mineral analysis. The laboratory does not provide prussic acid analysis. In addition, the laboratory manufactures field quick tests for plant nitrates, which sell for \$10 each.

For further information about the Soil, Water and Forage Testing Laboratory call 409-845-4816.